

an excitation energy source coupled to the first reaction chamber to generate a nitrogen plasma comprising ions and radicals from the nitrogen gas; and

a second reaction chamber adapted to house a substrate for film formation at a site in the second reaction chamber,

wherein the first reaction chamber is coupled to the second reaction chamber and separated from the substrate site by a distance equivalent to the lifetime of the ions at a plasma generation rate such that the radicals react with the substrate in a film conversion step.

2. The apparatus of claim 1, wherein the excitation energy source supplies energy having a microwave frequency to generate a plasma from a gas.
3. The apparatus of claim 1, wherein the second reaction chamber is electrically non-biased.
4. The apparatus of claim 1, wherein the first reaction chamber is adapted to generate a nitrogen plasma, and the dimensions of the first reaction chamber are configured such that substantially all of the ions generated by the plasma are changed from an ionic state to a charge neutral state within the first reaction chamber.
5. The apparatus of claim 1, wherein the second reaction chamber is a rapid thermal processing chamber.
6. An apparatus for exposing a substrate to plasma, comprising:
 - a first reaction chamber;
 - means for supplying a nitrogen gas to the first reaction chamber;
 - means for generating a plasma from the nitrogen gas, the plasma comprising ions and radicals;
 - a second reaction chamber having means for housing a substrate for film formation processing; and
 - means for providing the plasma to the second reaction chamber substantially free of ions such that the radicals react with a substrate in a process conversion step.
7. The apparatus of claim 6, wherein the means for supplying a plasma comprises means for converting the gas to a plasma in the first reaction chamber.
17. (Three Times Amended) A system for reacting a plasma with a substrate, comprising:
 - a first chamber;

a gas source coupled to the first chamber comprising constituents adapted to react with a substrate;

an energy source coupled to the first chamber;

a second chamber configured to house a substrate for film formation processing;

a system controller configured to control the introduction of a gas from the gas source into the first chamber and to control the introduction of an energy from the energy source; and

a memory coupled to the controller comprising a computer-readable medium having a computer-readable program embodied therein for directing operation of the system, the computer-readable program comprising:

instructions for controlling the gas source and the energy source to convert a portion of a gas supplied by the gas source into a plasma comprising plasma ions and radicals.

wherein the first reaction chamber is separated from the second reaction chamber by a distance suitable to deliver the plasma to the second chamber substantially free of ions to react with a substrate in the second chamber in a film conversion step.

18. The system of claim 17, wherein the dimensions of the first chamber are configured such that substantially all of the ions generated in the plasma are changed from an ionic state to a charge neutral state in the first chamber.

19. The system of claim 18, wherein the gas is nitrogen.

20. A machine readable storage medium containing executable program instructions which when executed cause a digital processing system to perform a method of reacting a plasma with a substrate, comprising:

generating a plasma comprising radicals and ions in a first chamber; and

transferring the plasma radicals into a second chamber substantially free of ions.